

Title: Data Analysis and Graphs; Researching the Rainforest

Brief Overview:

Students take a mock journey through the rainforest and explore various ways to display and analyze data. Through investigation they learn the value of displaying data in graphic form. Students examine elements of graphs and relationships between tables and graphs. Once data is displayed students are challenged to draw conclusions. Probability is integrated into this unit as a method to predict data based on sampling the data.

NCTM Content Standard

Data Analysis and Probability:

- Formulating questions that can be addressed with data and collect, organize, and display relevant data to answer them.
- Select and use appropriate statistical methods to analyze data.
- Develop and evaluate inferences and predictions that are based on data.

Grade/Level:

3-4

Duration/Length:

5 days

Student Outcomes:

- Students will be able to use data and arrange it in a chart, bar graph, line plot or line graph.
- Students will be able to complete a table and take surveys using tally marks.
- Students will be able to analyze the results of data.

Materials and Resources:

- Snap Cubes
- Centimeter Rulers
- Measuring Tape
- Origami Paper
- The Great Kapok Tree
- Poisoned Frogs, Jewels of the Rainforest

Lesson 1

Launch -Distribute an overview of the unit (SR1) and samples of the following graphs: bar, line, line plot and circle (SR2, SR3, SR4, SR5) The teacher will note the elements of each graph with emphasis on the bar graph.

Preassessment- Ask each student to name his/her favorite school subject. Challenge the class to think of a way they could display this information. Wait for a student to suggest a bar graph or supply this information for the children. Give a post it note to each child and create an x- axis (names of subjects) and y- axis (number of votes) on the board. Call each student to the board to place his/her post it note above his/her favorite subject in a vertical column. After data is displayed ask the class to supply a title for the graph.

Teacher Facilitation –Identify the elements of the bar graph (title, bar labels, scale, and labels for each axis). Modeling for the students, analyze the data by thinking aloud. You may say: I can see that math is a popular subject in this class because it has the highest number of votes. I can see that Social Studies and Science are equally liked because they have an equal number of votes, etc. Create a second bar graph with the class this time taking a class survey on any topic (favorite pet, sport etc.). Record data on a tally table on the overhead. Model how this information is used to create a bar graph.

Student Application – Give students a copy of Student Resource Sheet #6. Tell students on their journey through the rainforest they discovered a new species of ant. They have the task of naming this ant. Have them select three possible names for this ant. They will then conduct a survey of the class to determine the most popular name for the ant and display the data in a bar graph. Use Student Resource Sheets #7&8.

Embedded Assessment – The teacher will circulate throughout the room and observe student progress looking for elements of a bar graph.

Reteaching/Extension –

- For those who did not completely understand the lesson, model graphing another survey in a small group setting.
- For those who have understood the lesson, take them to the next step in development of the concept. Have them select the name they will give the ant and write a paragraph explaining why they will use this name. Students must support their choices.

Lesson 2

Pre-assessment: On the overhead students will identify several graphs (**SR9**). In a class discussion students and the teacher will evaluate the graphs for the proper information, such as titles, axis, and scales. Students will also review place value up to the hundreds by completing a place value chart (**SR10**).

Launch: Students will explain what they know about the rain forest by completing a journal prompt (**SR11**) that will challenge the students to explain what they know about the rain forest. Student will then listen to the story the Great Kapok Tree, by Lynne Cherry. Students will listen to the story to find information about the rain forest. Students will then share their journal entries and compare their journals with the Great Kapok Tree.

Teacher Facilitation: Pass out two versions of rain forest data (**SR12-A**); one will be a narrative (**SR12-B**) and the other will be a data display(**SR12-C**). This will allow children to notice the ease of reading a chart versus a narrative. The teacher will then distribute rain forest data about endangered species. The data was received from www.ran.org (The Rain Forest Action Network). Students will look at the data that is arranged on the table and the class will hold a discussion about the different animals being affected by the destruction of the rain forest (**SR13**). Students will then complete the questions at the bottom of the table and then begin to make their graphs in cooperative groups of 4(**SR14**).

Student Application: Students have now completed their bar graphs on paper. With the same data set, students will build a 3-d bar graph using snap cubes. The red cubes will represent 1's, the yellow cubes will represent 10's and the blue cubes will represent 100's. Students are then asked to arrange the bars from shortest to longest and label each cube with the original number. Students must put the highest value at the top. **SR15** provides an example.

Embedded Assessment: The teacher will circulate throughout the room and make sure that the cubes for each bar are color coordinated correctly.

Re-teaching/Extension:

- In small groups the teacher will assist students who have not mastered the lesson. Students will complete similar activities as a cooperative group.

Lesson 3

Pre-assessment: Students will have to know the names of geometric shapes in order to know how to fold the Origami frog correctly. Students will view pattern blocks and name the shapes of each. Students will measure the distance of their jumping frog in centimeters. Students will view a centimeter ruler on the overhead projector in order to see the scale of a centimeter ruler. Students will then measure objects, such as, pencils for practice. Students will also need to construct and analyze a line plot.

Launch: Students will then be introduced to a line plot. The definition of a line plot will be given (a graph that indicates the location of data points along a segment of the real number line). Students will also review the following vocabulary; median, range, and mode (**SR16**). Students will view a sample line plot (**SR17**) on the overhead projector and answer questions using the line plot (mainly focusing on the vocabulary). Students will listen to a non-fiction selection titled, Poisoned Frogs, Jewels of the Rainforest, by Jerry Walls. Students will view pictures and listen to captions that are read by the teacher. Students will then make origami jumping frogs. The directions can be found at <http://netro.ajou.ac.kr/~lastfrog/frog/froggy/origami/origami.html>. Students will complete this as a class following the teacher's lead. After frogs are made, students will make their frogs jump and the students will measure the jump to the nearest centimeter. Each child will write their frog's results on the board.

Teacher Facilitation: After the results are on the board students and the teacher will make a table to display the distance of the frogs (**SR18**). Students will then discuss briefly the lowest and highest scores.

Student Application: Students will complete a line plot on their own paper to display the data. Students will be required to find the median, mode, and range.

Embedded Assessment: Students will complete a journal prompt (**SR19**) to explain what they noticed about the frogs and their jump distances. Students will also write why a line plot is useful and why it is easy to read.

Re-teaching/Extension:

- Students who have not mastered the skill will complete the line plot with the teacher in order to gain better understanding.

Lesson 4

Preassessment- Have students refer to Student's Favorite Rainforest Animals (SR 20). Ask them to draw conclusions from this data.

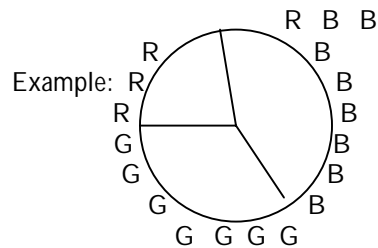
Launch- Tell students they are going to create a circle graph based on probability.

Teacher Facilitation- Display an overhead copy of Probability Data Collection sheet (SR21). Model pulling out samples from a paper bag filled with different proportions of 20 cubes that are red, blue and green and record the data on the chart. Ask students to predict the number of cubes of each color that are in the bag based on the data recorded. Discuss reasonable predictions. Explain that reasonable predictions are tied to data. Display an overhead copy of Probability Circle Graph (SR22) and model filling in the prediction. Tell students to open their bag and shade in the actual amounts on the outside portion of the graph to show the class how close the actual amounts are to the prediction.

Student Application Distribute Probability Population Data Collection (SR21), Probability Circle Graph (SR 22) and a paper bag containing a total of 20 cubes of different proportions of red, blue and green to each student. Have students complete the same activity on their own.

Embedded Assessment- Observe students as they are making predictions to see if their predictions are reasonable. Ask them to examine the graph they have created and draw conclusions regarding the relationship between samples and the actual number of cubes in a bag.

Reteaching- In a small group give these students a new bag with cubes in it. Take the cubes out and sort them by color. Then have them arrange the cubes, by their color around the circumference of a circle. They can then create a circle graph by coloring the sections of the circle correspond to each color:



After creating the graph ask the students to predict what color would most likely be pulled, least likely etc.

Extension: Ask students to collect data from 12 people in the room using only one attribute(hair color, favorite food etc). Then ask them to create a circle graph representing this data. Remind students that circle graphs show parts of a whole and 12 is their whole this time.

Summative Assessment:

The students will complete the Assessment Activities (SR23 through SR27). They will apply their knowledge of data analysis, and charts and graphs. These activities will allow the students to prepare explanations for mathematical concepts. This section should describe how teachers will determine student's progress towards understanding the concept of the lesson (similar to state assessments like the MSA or HSA).

Authors:

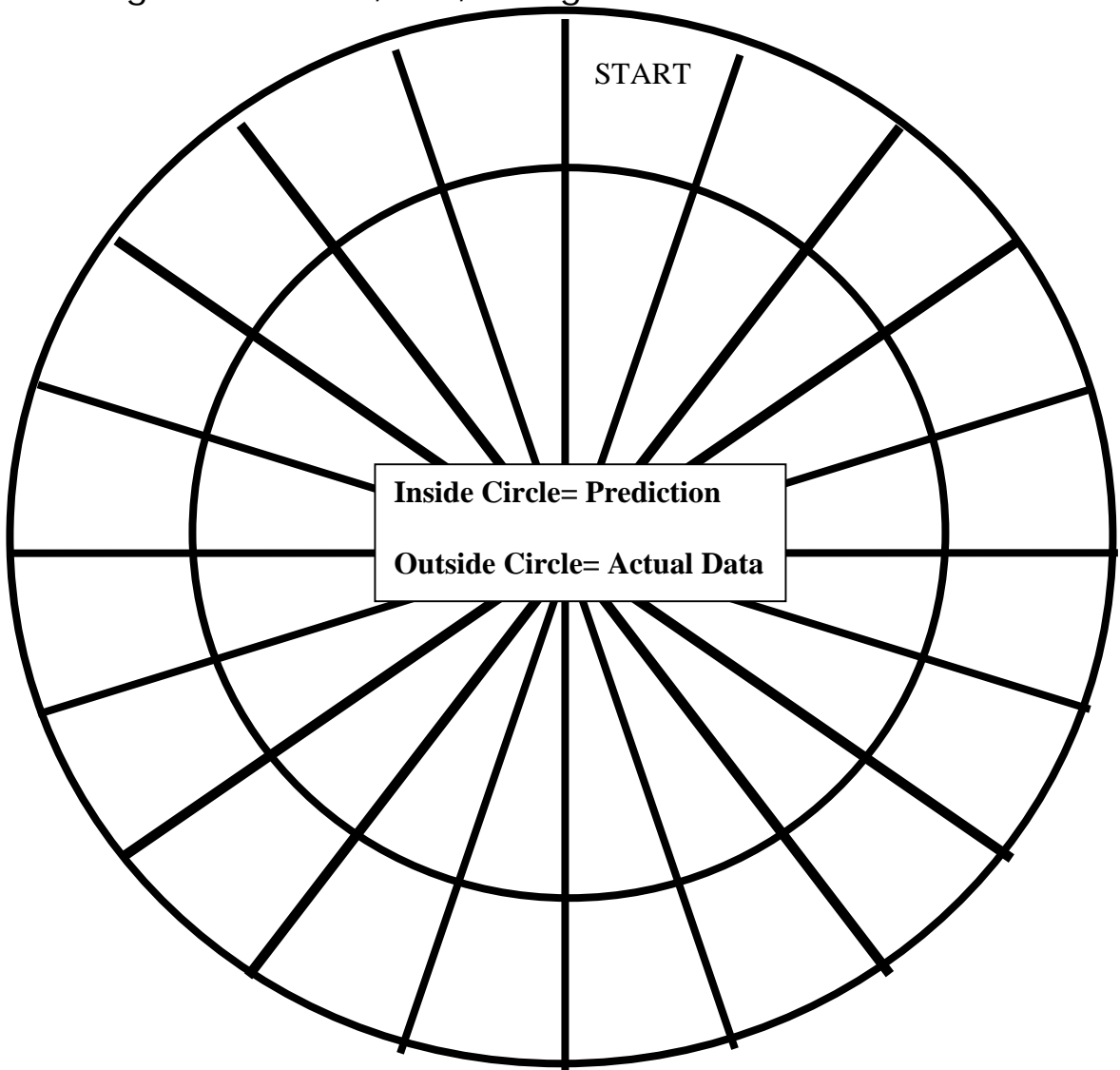
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Name_____

Student Resource 22

You will now create a circle graph using the data you predicted and the actual data. Begin at the START and color the spaces to match your prediction and data in the following order: blue, red, and green.



What conclusions can you draw looking at this data?_____

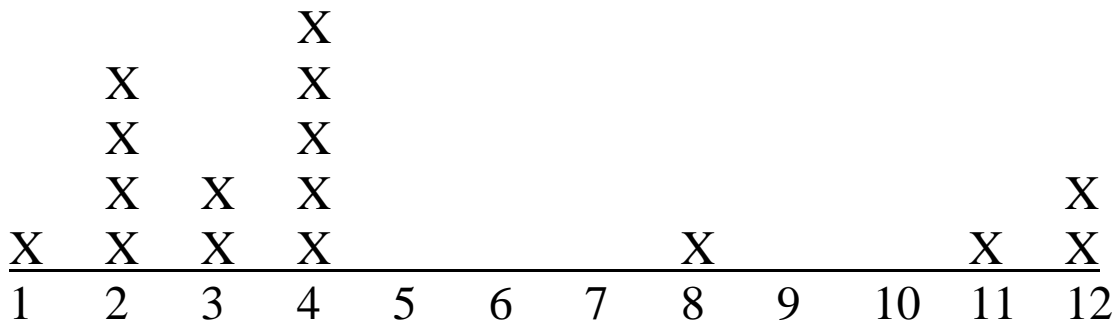
Rainforest Research



Congratulations! As part of the junior ecologists program, you have been selected to collect data from the rainforest. Your journey will last five days. When you return, you will be responsible for reporting the data in the most appropriate displays and analyzing the results. Before you leave you need to research the many possible graphs you might use.

Line Plot

Number of Keys on a Key Ring



Number of Keys

Name_____

Student Resource 6



You have discovered a new species of ant on a tree in the rainforest! Draw a picture of your ant below.

Examine the attributes of your ant. What color is it? How big is it? How does it behave? Think of three possible names for your ant and list them below.

1. _____

2. _____

3. _____

Name_____

Student Resource 7

Tally Chart for Number of Votes for Each Ant Name

Possible Name for Ant


Votes



Name_____

Title

Number of Votes

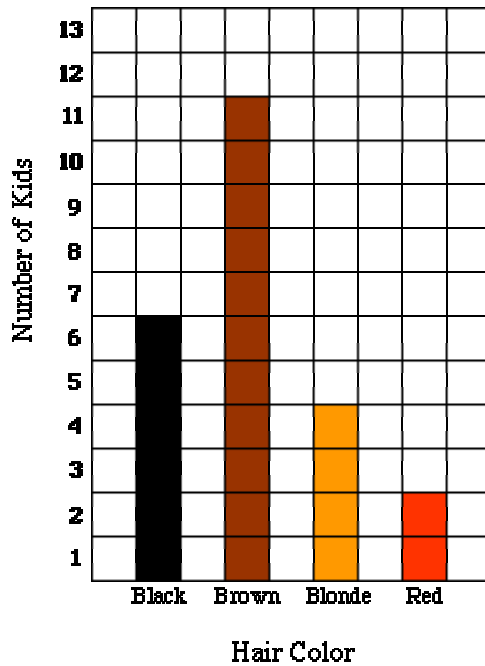


Possible Names For The New Species
of Ant

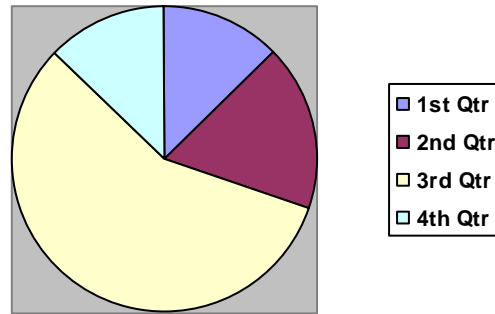
Name That Graph!

Directions: Identify the type of graph on the line under each graph.

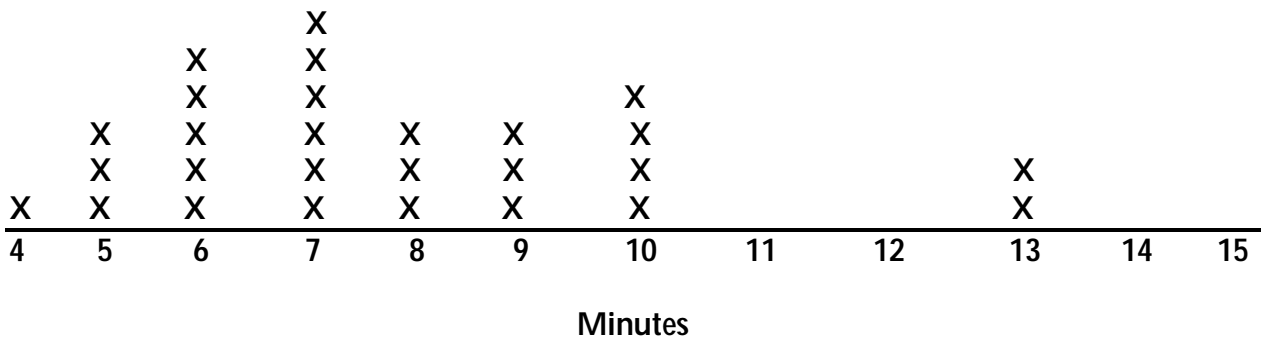
Hair Color in Our Class



Sales Meeting



Minutes to Get Dressed





Place Value Chart

<u>Hundreds</u>	<u>Tens</u>	<u>Ones</u>
3	1	5
2	3	5

Journal



Explain what you know about the tropical rainforest.

[illegible]

Can You Answer Questions from a Favorite Color Survey?

Teacher Directions

Distribute Resource 12A to one side of the room and 12B to the other side of the room.

Tell Students:

In a survey, students were asked about their favorite colors. You have the information in front of you.

When told, turn your paper over and read the results.

You will have 10 seconds to read the survey. Then you will be asked some questions about it.

The object is to get students to see that information in a data display is easier to read than a narrative.

Favorite Color Survey

Cool Cory and crazy Kim liked red, but lazy Lee and intelligent Ian liked blue. Jamming Jill, bossy Bill, jazzy Jack and terrific Tracy yearned for yellow. I almost forgot that lively Lynn, kind Ken, and shocking Shawn loved white. Last but not least lovely Lisa loved purple!

Favorite Color Survey

Favorite Color

Jill

Bill

Lynn

Cory

Lee

Jack

Ken

Kim

Ian

Tracy

Shawn

Lisa

Red

Blue

Yellow

White

Purple

Name _____

Date _____



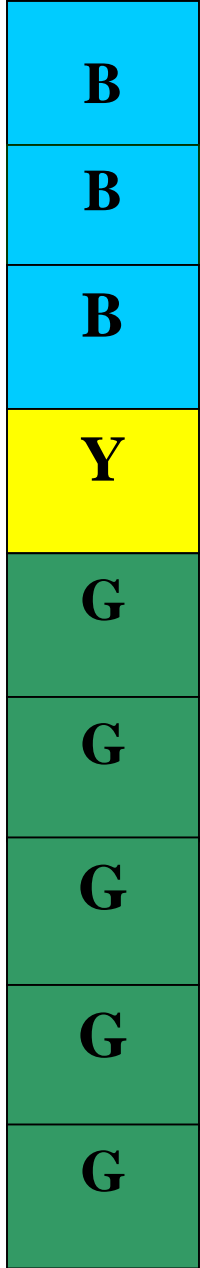
Endangered Species Data



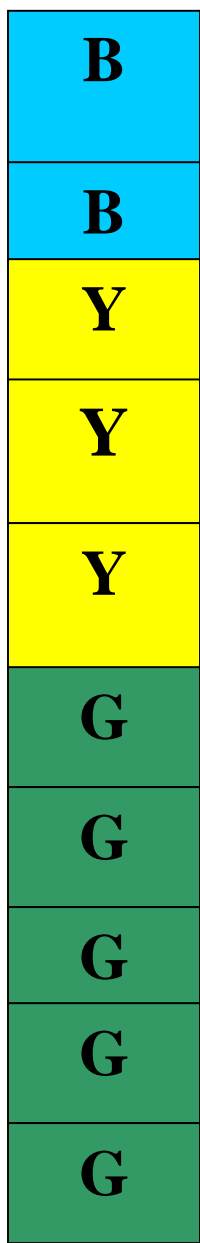
Class 	Endangered
Mammals	315
Birds	235
Reptiles	59
Amphibians	31
Insects	116
Other Animals	423

Directions: Use the above data to complete a bar graph.

1. First decide your title: _____
2. Think about your scale: How will you count? By 1's, 2's, 5's, or 10's.
3. Label the scale (y- axis) _____
4. What will the x-axis be called? _____
5. Will you use horizontal or vertical bars? Construct one bar per category on the x-axis with the length of the bar equal to the count for the category.



315



235

Blue: hundreds

Yellow: tens

Green: ones

Keep in mind that the heights of these figures are not accurate because the rectangles are different sizes. The cubes that the students will have will be the same size. The students must arrange the bars from greatest to least or least to greatest.

Name_____

Title



Definitions

Median: The measurement that lies in the middle after the measurements are put in order from smallest to largest. The median represents a type of center of the data set.

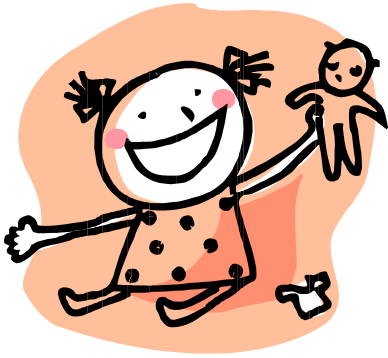
Ex. This is the data set: 2,2,4,6,9,9,9,9,10,11,11
The median is 9, because it is in the middle.

Mode: The high point of a data distribution; it represents the data value or values that occur most often in the data set.

Ex. This is the data set: 2,2,4,6,9,9,9,9,10,11,11
The mode is 9, because it occurs the most.

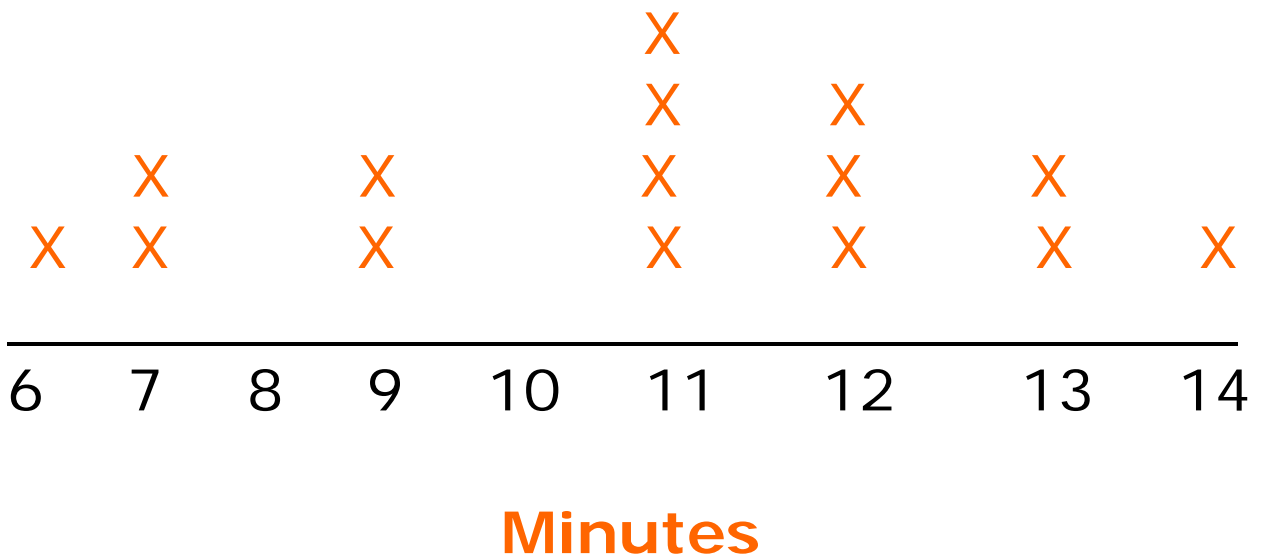
Range: The difference between the largest value in the data set and the smallest value in the data set.

Ex. If the data ranges from 5 to 20. Then you would subtract; $20 - 5 = 15$. The range is 15.



Sample Line Plot

How Long Does it Take to Make A Doll



How many people took less than 14 minutes?_____

What was the least amount of time?_____




What is the range of data?_____

What is the median?_____

What is the mode?_____



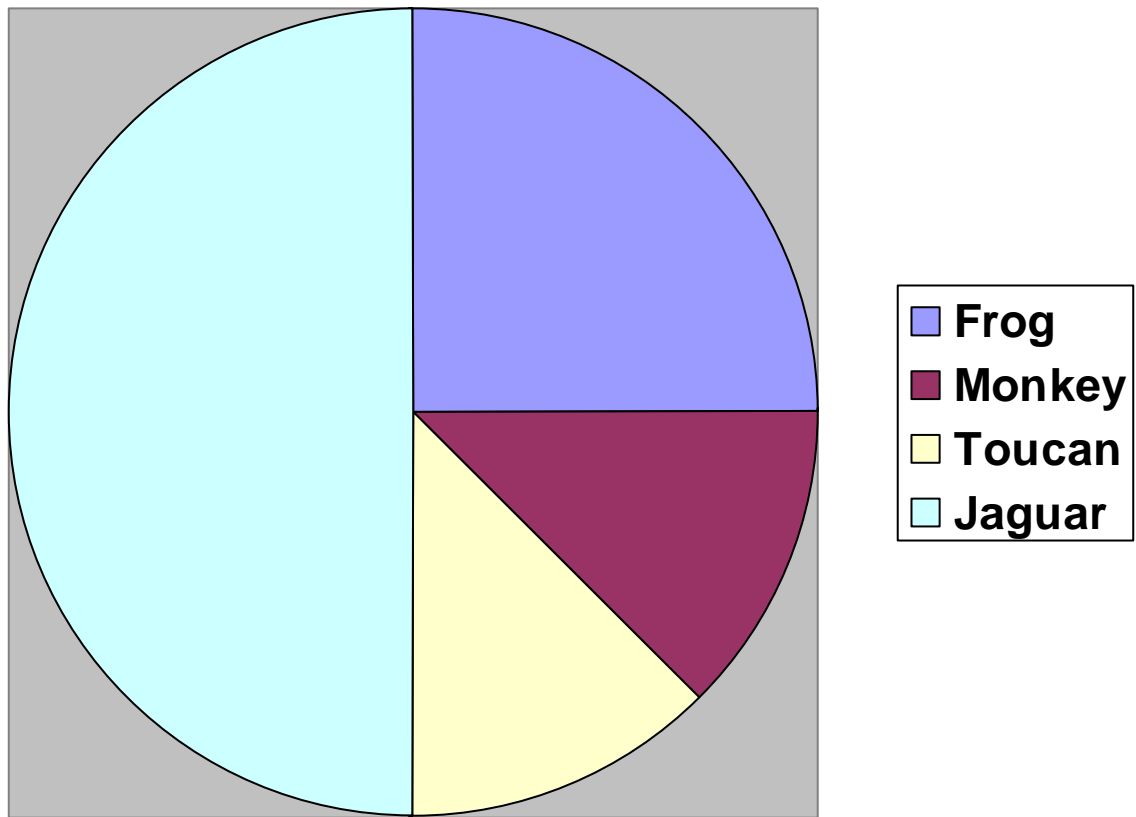
Sample of Frog Distances on a Table

Frog Distances	Tally Marks 
9 centimeters	III
11 centimeters	I
12 centimeters	HHH II
 13 centimeters	I
16 centimeters	III
20 centimeters	HHH III 
21 centimeters	II
23 centimeters	III
25 centimeters	II
26 centimeters	I

The Jumping Frog Race!

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

Students Favorite Rainforest Animal



Name_____

Student Resource 21

Population Probability Data Collection

Scientists often take samples of populations in order to predict the number of species that may live in a population. Your teacher has given you a bag that contains 20 cubes. Without looking in the bag you are going to pull out a sample of 5 cubes and record the number of each color on this chart. You will do this four times. Be sure to return each sample to your bag before pulling a new sample.

	Red	Blue	Green
First Sample			
Second Sample			
Third Sample			
Fourth Sample			
Total of all Samples			

Using the data above, predict the number of each color in the bag. Remember there is a total of 20 cubes in the bag.

Red: Blue: Green:
Now open your bag and record the actual data.

Red: Blue: Green:

Name_____

Student Resource 23

Before you left for your rainforest journey you surveyed people on what rainforest resource they enjoy most. This is the data you collected.

Resource	Number of Votes
Chocolate	30
Vanilla	22
Bananas	22
Cinnamon	15

Use this data to create a bar graph on a separate sheet of paper.

What will be your scale?_____

Why did you choose to use this scale?_____

Name _____

Student Resource 24



What conclusions can you draw looking at this data? _____

Name_____

Date_____

Grade 3-Line Plot

John needs to arrange the following data about the number of visits to the Principal’s office by each of his classmates.

<u>Name</u>	<u>Times to the Principal’s Office</u>
Kevin	5
Ron	2
Kisha	0
Janet	3
Molly	1
Steve	1
Jason	0
Kim	6
Casey	2
Jasmine	1
Sharon	1
Sheila	5
John	0

Part A

Make a line plot with the following data.

Title:_____

Scale:_____

Part B

Using the data that you have put on the line plot, explain what you notice about the data. Include the median, mode, and range.

Name_____

Student Resource 26

In an ecosystem, living things depend on each other. Scientist often gather information on the size of a population of a species. A change over time may indicate a problem. You have been asked to research the populations of three different fictional species of frogs in the rainforest: the blue frog, the yellow frog and the green frog. Your teacher has given you a bag that contains 20 cubes. These cubes represent the frog population in the rainforest. Without looking in the bag you are going to pull out a sample of 5 cubes and record the number of each color on this chart. You will do this four times. Be sure to return each sample to your bag before pulling a new sample.

	Blue	Yellow	Green
First Sample			
Second Sample			
Third Sample			
Fourth Sample			
Total of all Samples			

Using the data above, predict the frog population in the rainforest. Remember there is a total of 20 "frogs" in the bag.

Blue Frog:

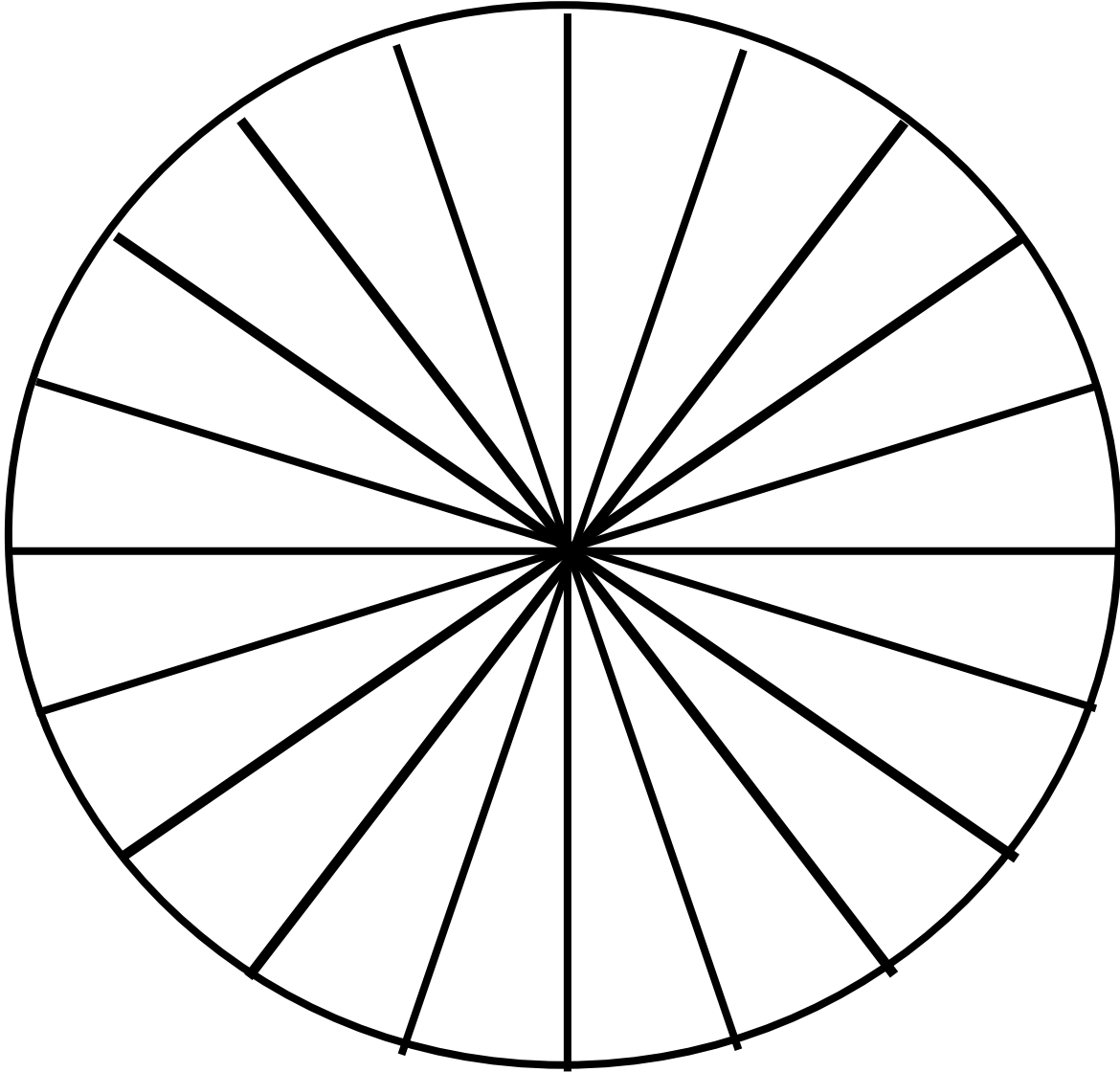
Yellow Frog:

Green Frog:

Name_____

Student Resource 27

You will now create a circle graph using your prediction of the frog population in the rainforest.



What conclusions can you draw looking at this data?_____
